NEWS

...ble deck construction for a riverfront road.—see p. 8

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2,000,000 GALLON radial-cone elevated water tank at Buffalo, N. Y.

1,500,000 GALLON elevated tank with tubular columns at Indianapolis, Ind.

1,000,000 GALLON water tank of radial-cone design at Winston Salem, N. C.

500,000 GALLON radial-cone design tank in the waterworks system at Naperville, Ill.

ONE million . . . TWO million . . . THREE million gallons

A relatively large number of elevated water tanks of one million, one and one-half million and two million gallons capacity have been built during the last decade. And there's no reason why we can't or shouldn't build capacities of three million, or even four million gallons, during the next decade.

Thanks to the radial-cone design, these large capacities can be built with a low range in head so that all of the capacity is available at serviceable pressure. In fact, most large tanks have a range in head of only 25 ft.—which is less than many smaller installations.

Thanks also to the radial-cone design, the architectural features of these large structures can be made to harmonize with their surroundings. They may be built with structural towers or with tubular columns. The balcony can be omitted and several small columns may be used at the center instead of one large riser.

With present day designs and range of sizes, there's no reason why every city shouldn't take advantage of all the economies of elevated storage. The next time you design waterworks improvements, write our nearest office for estimates on installations to meet your requirements. State the capacity, location, height to bottom and range in head.

CHICAGO BRIDGE & IRON COMPANY

Chicago	2101 Old Colony Bldg.	Boston	1507 Consolidated Gas Bldg.	Dallas	1402 Liberty Bank Bldg.
New York	3311-165 Broadway Bldg.	Houston	2919 Main Street	Detroit	1506 Lafayette Bldg.
Cleveland	2201 Rockefeller Bldg.	Tulsa	1617 Hunt Bldg.	San Francisco	1020 Rialto Bldg.
Philadelphia	1625—"1700" Walnut St. Bldg.	Birmingham	1520 North Fiftieth Street	Los Angeles	1411 Wm. Fox Bldg.

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, Pa.

ENGINEERING NEWS-RECORD

NEWS

Volume 124 FEBRUARY 22, 1940 Number 8

NOTES ON THE NEWS

Quick Surveys of Construction Events

▶ North Atlantic highway officials meeting last week at Atlantic City were told that our highway system is a failure from the safety standpoint and inadequate from the defense angle.

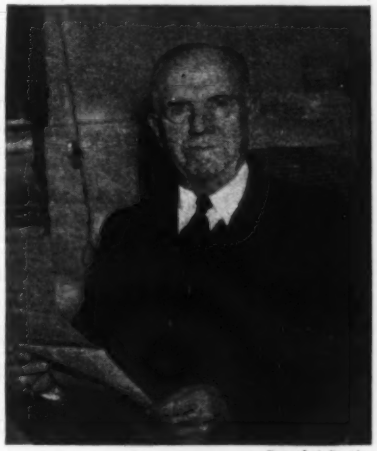
▶ Plans for a national sewage works group have been formally announced by William Orchard, chairman of the arrangement committee for the New Jersey Sewage Works Association's silver anniversary meeting March 20, when definite action on the plan is expected.

▶ The Texas State Highway Commission has designated May 26 to 31 as Texas Highway Week in an attempt to educate the public as to the value of highway planning, safety and construction.

▶ Rep. Warren G. Magnuson, chairman of the International Highway Commission, reports that a tentative agreement has been reached for a middle route through British Columbia for the proposed Alaskan international highway and that in a few weeks concrete recommendations will be made to Congress.

▶ Driving 3,100 ft. in 31 days at Shaft 4 of the Delaware Aqueduct, the Walsh Construction Co. last month set a new world's tunneling record from a single shaft. In addition work in the south heading exceeded the old record for a single heading.

▶ Without a kick from the conservative members, the Engineering Institute of Canada last week voted to send to ballot a proposal to abolish the corporate grade of associate member. This is being done to simplify closer cooperation with the provincial professional associations. Two provincial associations already have entered into agreements for a close cooperation.



Snapshot Service

SPENDS 50 YEARS AT ATLANTA IN MUNICIPAL SERVICE

WILMER ZODE SMITH, for the past 30 years general manager of the Atlanta waterworks, Jan. 22 celebrated his fiftieth year as an employee of the city of Atlanta. Smith first served as marshal for the city. Later he became affiliated with the water department and after 13 years was elected secretary of the board of water commissioners. In 1911 he was made general manager of the Atlanta waterworks, a position which he still holds.

When Smith joined the Atlanta water department the city was consuming about 3,000,000 gpd and had a water plant valued at between two and three million dollars. At present the system is valued at 20° million dollars and supplies 38,000,000 gpd.

Texas to Emphasize Importance of Its Roads

The Texas State Highway Commission has designated May 26 to 31, inclusive, as Texas Highway Week. Matters affecting highway finance, new procedures developed in construction and maintenance of roads, highway safety and highway economics will be stressed during the week. The purpose of the program is to make the public more conscious of the importance of modern highways to economic welfare.

Highway Officials Study Safety

North Atlantic state officials hear road system called a failure from a safety standpoint

Meeting at Atlantic City last week, the Association of Highway Officials of the North Atlantic States was told that any highway system on which 32,000 persons were killed and 90,000 permanently injured annually is a failure. Remedial measures were discussed, highlighted by an account of New Jersey's experience with reflecting curbs. Other subjects of interest included a discussion of the present controversy between rail and highway transport, WPA in construction and roads for military use.

James Logan, New Jersey state highway engineer and president of A.H.O.N.A.S., stated that eastern roads still require a large amount of work and recommended that road money be

(Continued on p. 6)

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Continental Divide Tunnel Work to be Divided

The Reclamation Bureau's uncertainty as to what to do about the unwillingness of contractors to offer what the bureau considered reasonable bids on the Continental Divide Tunnel of the Colorado-Big Thompson project was resolved last week. Secretary Ickes announced that the single bid received on the last contract advertisement had been rejected, and that the job will be split up into several small contracts.

The first bid will be asked soon on a mile-long section at the low eastern end of the tunnel. No intimation is given as to whether other contracts will be offered soon, but, because the tunnel runs under a national park in which adits may not be driven, it would obviously be impossible to let any additional contracts, except one at the other end, until the first contract is completed.

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Engineering Institute of Canada Acts to End Associate Member Grade

Proposal to eliminate intermediate grade of membership sent to ballot as a step in the movement to obtain close cooperation between the professional and technical associations in Canada

The Engineering Institute of Canada, at its annual meeting in Toronto, Feb. 8-9, voted to send to ballot by its members a proposal to eliminate the grade of associate members in the institute. At the meeting, no voice was raised against the proposal, which had been under discussion for some years as a desirable step toward closer cooperation between the provincial professional associations and the institute. Under the approved plan of cooperation, engineers who are admitted to membership in the provincial associations automatically become members of the Engineering Institute of Canada in provinces where the cooperative agreement is in effect. (Admission to membership in the provincial professional associations corresponds to licensing by a state engineer-license board in this country).

Nova Scotia agreement signed

At the time this action was taken by the institute it was announced that by a unanimous vote of the counsel of the institute and by almost unanimous vote of the corporate members resident in Nova Scotia, the institute has come to an agreement with the Association of Professional Engineers of Nova Scotia whereby the latter organization becomes a "component association" of the institute. Nova Scotia is the second province to enter into such an agreement, Saskatchewan having taken similar action in 1938. Officers of the institute reported that good progress is being made on similar agreements in two other provinces.

Thomas H. Hogg, chairman, Hydro Electric Power Commission of Ontario, was inducted into office as president of the institute at the annual dinner. H. W. McKiel, retiring president, in his address dealt with the social relations of the engineer.

Economic conditions

The incidence of war upon Canadian economy was reflected in all the principal speeches delivered at the meeting, but war conditions did not affect the attendance. C. F. James, new principal of McGill University, speaking on the economic and administrative measures of an unusual nature that must be developed in Canada during the war period, appealed to engineers to assist as far as possible in the operation of the trade regulation boards which have been set up and to give thought now to the economic problems that will have to be faced immediately after the war is over.

The opening technical session was devoted wholly to consideration of a paper entitled "The Economic Front," by G. A. Gaherty, president, Montreal Engineering Co. So controversial were the views expressed in the paper that the institute, in printing it, made a special disclaimer that the views expressed were those of the author alone.

Stating that the outcome of the present war will depend largely on the effectiveness in which industrial facilities are mobilized and natural resources and manpower are utilized, Gaherty proceeded to review all the main features of the Canadian economy in trenchant style, proposing various expedients for the achievement of the ends sought. His paper ended with an appeal to engineers to use their good offices and special skill in reconciling differences in these troubled days, and in supporting the government with their constructive ideas.

Most of the period set aside for discussion was taken up with the reading of a very long paper by William T. Jackman, University of Toronto, which was confined chiefly to comment on Canadian railway problems and the proposed St. Lawrence waterway. The Canadian National Railway system was severely criticized and the waterway was declared to be entirely unjustified economically. In the discussion C. R. Young, University of Toronto, stated that most of Canada's difficulties in connection with transportation can be traced to divided control, some agencies being under federal and some under provincial control. C. M. Goodrich, chief engineer, Canadian Bridge Co., suggested a relaxation on some parts of existing building regulations as a contribution to economy under war conditions. Miss E. McGill, only woman member of the institute, added a lighter touch by suggesting that much of what Gaherty had proposed was pure socialism. Gaherty disclaimed any such leanings, reminding the members that he was generally described as one of Canada's "power magnates being president of a power company."

Traffic control

An engineering approach to highway accidents was stressed by Angus D. Campbell, speaking on highway control and safety. Citing the great progress made in the field of industrial safety, Campbell stated that similar results could be achieved on the high-

Des Moines Tribune Photo

BROKEN TRUCK WRECKS TRAIN ON BRIDGE IN IOWA

ELEVEN of the 23 cars of a Chicago Great Western freight train were derailed Feb. 15 on the bridge spanning the North River near Cumming, Ia., when a truck under one of the cars broke. Passenger trains were routed over the Rock Island tracks until the damage could be repaired.

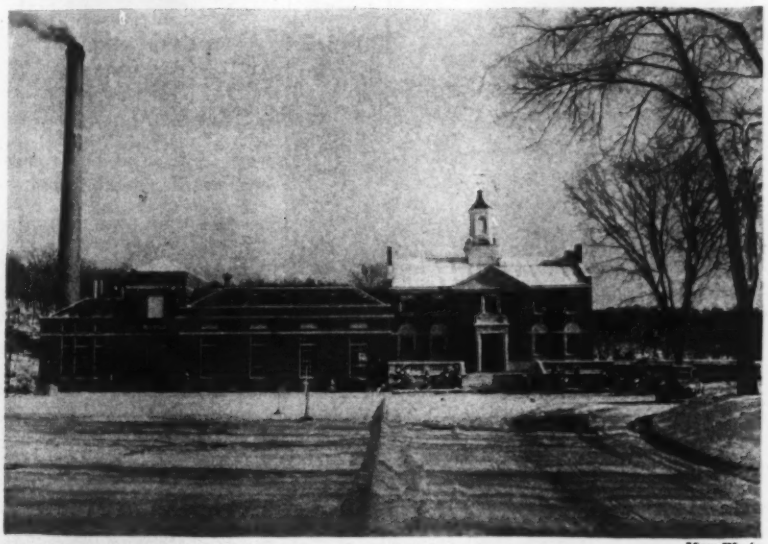
way if engineers would grapple with the problem. His suggestions were that the provincial highway department should have highway safety sections, directly under the chief engineer, and that highway engineers should be encouraged to attend public inquiries into highway accidents.

Soil mechanics

The application of soil mechanics to the construction of Shand Dam, now being built by the Grand River Conservation Commission in southwestern Ontario, was discussed by A. W. F. McQueen, and R. C. McMordie of the H. G. Acres Co., consulting engineers of Niagara Falls. The dam, 2,600 ft. long and 75 ft. high, has a central spillway section of concrete flanked by a long earth embankment (*ENR* Nov. 30, 1939, p. 726). Sampling and soil testing has been carried on under the direction of C. R. Young in the civil engineering laboratories at the University of Toronto.

In discussion, D. S. Laidlaw, Toronto, cited some of the features observed during construction, and R. F. Legget, University of Toronto, pointed out that both mechanical and mineralogical tests showed that the finest particles of the soils investigated were not clay, although of clay size, but fine rock flour.

C. M. Goodrich, chief engineer, Canadian Bridge Co., presented a stimulating discussion of the theory of limit design at the closing technical session. Participating in the discussion was J. A. Van den Broek, University of Michigan, who suggested that the theory of elasticity is really a secondary matter in the case of redundant members, also that although design work may emphasize elasticity, specifications tend to emphasize ductility. He concluded his remarks by suggesting that top-heavy theory can easily be built on the basis of tests on small scale specimens and recommended, therefore, that the result of full scale tests on transmission towers carried out some years ago by the Canadian Bridge Co. be published. This suggestion was supported by D. C. Tennant, Dominion Bridge Co., who suggested that more details of structural failures should be published. P. L. Pratley, Montreal, suggested that the limit design is still a theory and not a practice.



May Photo

COLONIAL ARCHITECTURE USED FOR SPRINGFIELD WATER PLANT

COLONIAL ARCHITECTURE marks the new waterworks plant recently placed in operation at Springfield, Mo., by the Springfield City Water Co. The building adjoining the stack houses the new boiler plant with the highest portion inclosing the coal bunkers. The intermediate building contains the turbo-centrifugal pumps and electric generators. The pumps are of 6, 9 and 11 mgd capacity. The central structure is the head house for the new filtration plant, the filters to be built this summer in an area at the extreme right. The 2 mgd clear water reservoir is entirely underground in the left foreground. Top of the new coagulating basin for slow mixing, flocculation and settling shows back of the automobiles.

The work was done as part of a $1,000,000 improvement during 1939. Alvord, Burdick & Howson, Chicago, acted as engineers. Negotiations for sale of the property to the city of Springfield are now under way with evaluations of the property being completed by three consulting firms, namely, Alvord, Burdick & Howson, Black & Veatch, Kansas City, and Burns & McDonnell, Kansas City.

Congress Studies Kings River Project

Work delayed since last June by disagreement between army and reclamation engineers

Delayed since last June by disagreement between the Corps of Engineers and the Bureau of Reclamation, reports on the Kings River project were sent to Congress last week by the two agencies. The Kings River project, a $20,000,000 flood control, irrigation, and possibly power scheme, is located on a tributary of the upper San Joaquin River in California.

Last June the two reports were substantially complete but differed markedly on certain points. The Army Engineers estimated the cost of the dam at $18,000,000 and the Bureau arrived at a higher figure. In the face of this impasse, the President last August ordered the two agencies to get together.

Agree technically

As submitted, the reports agree on technical matters but still disagree on questions of finance and policy. Both reports recommend construction of a 413-ft. high concrete gravity dam storing 1,000,000 acre-ft. and costing $19,500,000—a more or less arbitrary compromise figure—of which half would be allocated to flood control and half to irrigation. Minor flood control works would cost an additional $200,000.

The army recommends installation of penstocks for ultimate power generation, while the bureau would immediately install a 15,000 kw power system costing $2,600,000.

Disagree on operation

On operation and maintenance policy the reports diverge. The Corps of Engineers wants to build the dam and then turn it over for operation and maintenance to local control. Local interests would make a lump sum payment of $4,700,000 in return for irrigation benefits. This figure is arrived at by taking the annual payment of $243,750 which would be required under the Reclamation Act to repay the $9,750,000 irrigation cost in 40 years without interest, capitalizing it at 3½ per cent, and deducting $400,000 as the capitalized value of the operation cost chargeable to flood control.

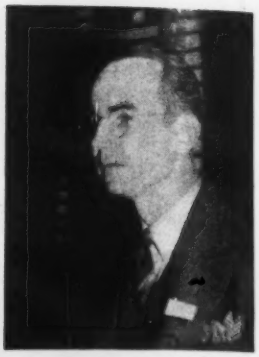
Attacking this proposal, the Bureau of Reclamation recommends that it build the dam and that repayment be made under the Reclamation Act; it asserts the water districts cannot borrow at 3½ per cent. Reclamation would operate the project itself rather than turn it over to local interests.

MEN AT WORK at th

These Spoke:

H. K. Bishop, PRA, rests after his discussion of highway building.

Col. Louis Johnson, Ass't. Secretary of War, ready to talk on "Construction in Peace and War."



H. B. (Pat) Zachry, Laredo, Tex., grimly assumes presidency of the association for the coming year.

W. A. Klinger, Sioux City, Ia., quizzes **W. E. Reynolds,** PBA administrator on the year's prospects.

John P. Coyne, pres., Building Trades Dept., A. F. of L., presents labor's story.

W. P. Nelson, U.S.B.R., **O. B. Coblentz,** Baltimore, and **J. D. Marshall,** A.G.C. staff, tell the Heavy Division what's in store for the year.

Brig.-Gen. Max Tyler, pres., Mississippi River Comm'n, tells what contractors can expect from the Corps of Engineers this year.

G.C. CONVENTION

These Listened:

Out of the Northwest came **Verne Warren,** Spokane, Wash., **Belle Dennis,** only woman chapter secretary in the association, who runs the Portland, Ore., group, and **H. A. Dick,** president of the Portland chapter.

Managing Director E. J. Harding and **Past-President Tony Horst** bear up under Toastmaster Klinger's stories.

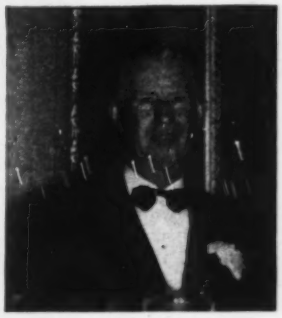
Pittsburghers Roy MacGregor and **J. S. Miller** heard lots of discussion about their heavy-highway labor agreement.

Rob't. V. Edwards and **Frank Connolly,** Los Angeles, made sure Southern California wasn't forgotten.

Frank Carswell, Kansas City, Mo., takes notes on **E. C. L. Wagner's** advice as to how to be a good president of the Missouri Branch.

A. J. McKenzie, (left) San Antonio, Tex., wears his Marshall Ford Dam smile.

Guy F. Atkinson, (right) retiring president, relaxes for the first time in a year.



Highway Officials

(Continued from p. 1)

used for roads rather than relief. Referring to the proposed Boston-Washington express highway, he pointed out that one-third of the country's population would be served by the road and recommended that its location be selected by the states that it will traverse rather than some outside agency.

Discussing highway needs of the country from a military viewpoint, Col. Stuart C. Godfrey, U. S. Engineers, stated that the government now has on hand data concerning the traffic load which will come on various roads if it is necessary to defend the Atlantic seaboard. He recommended a network of roads to connect important industrial with prospective mobilization centers as being of more value than transcontinental highways.

Highway safety

Safety was the theme of a session in which W. H. Cameron, managing director, National Safety Council, said that it is the engineer's job to make it difficult for the 40 million motorists to drive unsafely. Discussing intersection design, Joseph Barnett of the Public Road Administration gave data on proper curvature at ends of a central parting strip to provide safe turning of vehicles across opposing lanes of traffic. Barnett stated that lighting costs for a highway should be considered and included in the financial planning, and advocated first-class feeder routes from cities to by-pass highways. R. C. Georger, New York Department of Public Works, detailed the method of marking New York's highways, mentioning that they have found that white paint is easier to apply and more visible on pavements than yellow.

Reflecting curbs

Wm. Van Breemen, engineer of design, New Jersey State Highway Department, explained the application of the theory of reflection of light to the curbs of highways, showing with pictures how light rays are absorbed by a wet flat surface and how the new white cement curb used by his department reflects automobile headlights back to the driver, even in wet foggy weather. To accomplish this the curb is carefully designed with different angles of face to care for varying locations of the car head lamps with respect to the curb.

Highway men heard the railroads' side of the controversy between rail and road transport when L. W. Horning, regional director of the Association of American Railroads, told them that 14 per cent of the railroads' million dollars a day tax payment goes for highway and street improvement. Horning concurred in wanting equitable taxation on interstate carriers, stating that the railroads pay far more per ton mile than the subsidized carriers on the highways. Perry A. Fellows, WPA assistant chief engineer, outlined many highway improvements made by WPA and asked for better cooperation from local officials.

Pennsylvania turnpike

Current construction was covered in a description of work on the Pennsylvania Turnpike by Samuel W. Marshall, chief engineer of the turnpike commission. The magnitude of the job was shown by the statement that $12,000,000 worth of equipment was on the project and that 144 mi. of 48-ft. pavement are to be laid this spring for opening July 1. The future of highways was indicated in a description of the design and construction of the "Futurama" at the New York World's Fair by A. J. Schamehorn, director proving ground section, General Motors Corporation, who made the prediction that cars 20 years from now will be very much as today though perhaps smaller, lighter, and air conditioned.

Technical trends

Technical trends were indicated by a discussion of bituminous macadam surface by Frank C. McAvoy, construction engineer, Massachusetts Department of Public Works. Low cost road surfaces were covered in a paper by Herbert E. Sargent, commissioner and chief engineer, Vermont State Highway Department. The autoclave test for cement clinker was recommended by Ira T. Paul, director of laboratory, New York Dept. of Public Works, as a means of insuring certain qualities in cement without attempting to specify details of manufacture.

Officers for the coming year, introduced to the convention, were: H. E. Sargent, commissioner of highways of Vermont, president; Thomas C. Frame, chief engineer of the Pennsylvania State Highway Department, vice-president; and A. Lee Grover, secretary of the New Jersey highway department, secretary-treasurer.

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Plans for National Sewage Works Group Outlined

A formal announcement concerning the move to be initiated at the silver anniversary meeting of the New Jersey Sewage Works Association on March 20 toward formation of a national sewage works association (*ENR* Dec. 28, 1939, p. 857) has been made by William Orchard, chairman of the arrangements committee.

Orchard's statement says, in part: "The time has come, in my judgment, for men interested in furthering sewage disposal, either from the standpoint of design, construction, or operation, to have their knowledge increased and their efforts reinforced by a strong, national sewage works organization.

"During the past twelve years the Federation of Sewage Works Associations has done an excellent job, and those actively guiding its destiny can take pride in its fine journal and in

Fred Hess & Son Photo

NORTH ATLANTIC ENGINEERS DISCUSS BRIDGES AND SAFETY

BRIDGES AND SAFETY were the topics of discussion when A. G. Livingston, bridge engineer of Delaware; A. Lee Grover, secretary-treasurer of the American Highway Officials of the North Atlantic States; L. D. Barrows, chief engineer, Maine State Highway Commission, and R. S. Johnson, senior highway bridge engineer for the Public Roads Administration at Albany, N. Y., got together for the three-day meeting of the American Highway Officials of the North Atlantic States at Atlantic City, N. J.

the progress the journal has made. Many of us interested in the sewage field and particularly in the federation feel that its activities should now be extended through the appointment of a full-time secretary to cooperate with the member organizations, through active national working committees, and through an annual convention to spread greater technical and public knowledge of sewage disposal.

"A committee of the Federation has recently been appointed with such a plan in view; and it is my intention at Trenton, where the Federation of Sewage Works Associations was organized on March 23, 1928, to further this movement."

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World's Tunneling Record Set on Delaware Aqueduct

A new world's record in tunnel driving was established last month at Shaft 4 of the Delaware River Aqueduct in New York when Walsh Const. Co. advanced the south heading 1,619 ft. and the north heading 1,481 ft. in 31 consecutive working days, totaling 3,100 ft. for the shaft, or exactly 100 ft. per day. The driving period started Jan. 11, the start of the New York Board of Water Supply estimate month. During the same period Walsh drove 1,500 ft. in the north heading at Shaft 5, and 1,055 ft. in the much harder rock at the south heading Shaft 5. The ground is excellent at both shafts, no timbering being required in any of the four headings. At Shaft 4 the formation is a Hudson River Shale, containing sandstone streaks. Shaft 5 is in shales and sandstones. Excavation at both shafts is about 17 ft. diameter.

Progress at Shaft 4, south heading, eclipses the record for advance in a single heading established last October by John Austin at the Carlton Tunnel in Colorado, 1,534 ft. through hard granite.

Wm. Durkin is construction manager for Walsh Const. Co. on the Delaware tunnel project, Dick Byers is general timbering being required in any of the superintendent. Warming up for the big push, Durkin and Byers advanced Shaft 4 headings 2,398 ft. in December.

Caterpillar Tractor photo

ALBANY, GA. PULLS DOWN WALLS OF TORNADO-WRECKED BUILDINGS

DUG OUT of the debris of the Yancey Tractor Co.'s showroom, this new model diesel was put to work pulling down partly wrecked structures condemned by the city building department of Albany, Ga., following the tornado of Feb. 10. The storm, striking the city shortly before dawn, ripped through 12 blocks forming the heart of the business district and then cut a path through the residential area, destroying the homes on three blocks. Some of the buildings in the business district were entirely destroyed and the walls of nearly all the other structures along the main street were cracked. The local railroad station was unroofed and one locomotive was derailed. Telegraph and telephone service were also interrupted as property damage totaled $5,000,000.

WASHINGTON HIGHLIGHTS

Special reports by Paul Wooton

A REPORT to Congress on the proposed $25,000,000 Alaskan International Highway is now being prepared by Rep. Warren G. Magnuson of Washington and will be ready in a few weeks. Magnuson, chairman of the International Highway Commission, has been conferring in recent months with Canadian officials and says that tentative agreement has been reached on a middle route through British Columbia and the Panhandle section of Alaska around Juneau; his report will contain concrete recommendations for Congressional action.

IN A LAST DESPERATE MOVE to get a toehold in the housing field, Commerce Department is passing the hat among the various housing agencies for money to finance a campaign publicizing new low cost housing materials available but unusable because of building code restrictions. Commerce wanted $1,000,000 to build $2,500 demonstration houses, but the Budget turned them down. Chances of successful panhandling are poor since it was these very agencies, particularly FHA, which turned thumbs down on the orginal plan. FHA was afraid Commerce would raise a lot of false hopes which would undercut the present building market; and anyway, since last summer FHA has had it own plan, using modernization loan procedure, for financing $2,500 houses that can be built now.

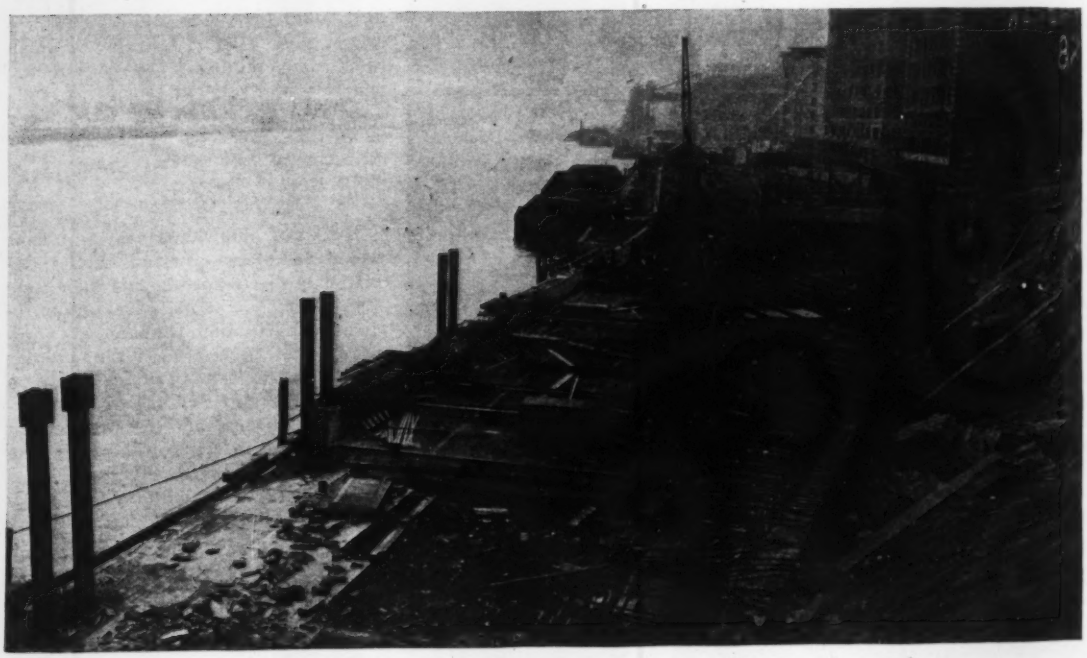
DETAILED individual investigations would not be required on small reclamation projects costing less than $50,000, under the terms of a bill introduced by Senator O'Mahoney. Ordinarily, the Secretary of the Interior has to make a finding of feasibility on each project before Congress may appropriate money, but the present bill would authorize appropriations up to $5,000,000 for the small dams. This program for the building of small dams should not be confused with the Great Plains program, for which $5,000,000 is available this year; on these latter, the Secretary must make an individual finding as to what part of the cost of each project should be reimbursable. The small dams projects, fully reimbursable, would mostly be jobs suggested by state agencies and not big enough to be worth the cost of a new investigation by the Bureau of Reclamation.

Close Quarters for a Superhighway

A NARROW ROCK SHELF was all that was left for the East River Drive here when apartment builders finished their work. Road engineers have built retaining walls, blasted rock and driven piles, to improve upon this restricted location.

IN RECLAIMING Manhattan's East River front for public highway use after three centuries of private occupancy it is not surprising that the City of New York has been forced to use narrow rights-of-way at various places. The two views on this page show points on the city's East River Drive where the building line has been maintained so close to the bulkhead line that it is necessary to carry the roadway on two levels. A third deck above these double-deck roadways forms a pedestrian esplanade. On part of the project this esplanade is for public use, and the rest of it is being built at the expense of the property owners as an extension of their community garden plots. At Carl Schurz Park the double-deck structure is carried over the river on concrete caissons.

The East River Drive is being built by contract along five miles of river-front at a cost of about $14,000,000. Along most of its length it is a six-lane road with a mall in the center. Where extra space is available it is devoted to public parks and recreational facilities. The whole job, with the exception of the portion between 30th and 49th Sts., is scheduled for completion in July.



NARROWING RIGHT-OF-WAY forces the East River Drive to go to two levels (topped by private garden area) at this point. Columns to support the upper deck are partly in place, and the ramp which carries upper level traffic downtown is under way. As a result of this project, individual hit-or-miss riverfront development is replaced by a unified program over a five-mile front.

MEN AND JOBS

JOE L. CAMPBELL, civil engineering graduate of the University of Kentucky in 1934, is now employed as general project superintendent for the WPA on three construction projects at Erlanger, Ky., one of the projects calling for the construction of a 17-mi. sewer and a treatment plant. Following his graduation, Campbell spent two years with the U. S. Forest Service on land surveying and for a time was employed by the U. S. Engineers at Fort Belvoir, Va., as 2nd Lieutenant on active army duty. The next two years were spent in Liberia, West Africa, on construction with the Firestone Plantations Co.

HENRY C. LAUB, who resigned in December as engineer of Cass County, Iowa, has been named engineer for Calhoun County, Iowa.

LAWRENCE W. VAN ORR, construction engineer, formerly with the federal government as resident engineer and inspector on public works projects, mostly in New York State, has now entered the construction field in Winter Park, Fla.

W. G. BESTER, former assistant engineer for Clarke County, Iowa, has been made engineer to succeed Gilbert N. McQueen who resigned to become engineer for Cass County.

CARSON CRAIG has resigned his position as engineer of Wayne County, Iowa, to return to his old job as engineer in Appanoose County, where he served as engineer for 11 years before going to Wayne County three years ago.

WALTER L. WOODWARD, draftsman with the Wyoming State Highway Department, has resigned to accept a position with the water facilities branch of the U. S. Soil Conservation Service, to be located at Billings, Mont.

C. A. BOEKE has been reappointed to serve as engineer of Hardin County, Iowa.

ARMAND E. KEELEY, assistant chief engineer of the Pennsylvania State Highway Department, has resigned. Keeley joined the department in 1920 as an inspector and in 1923 was made assistant engineer, advancing in 1924 to purchasing agent in 1924 and to assistant chief engineer in 1926.

MADISON NICHOLS, U. S. Engineers, has been transferred to Jacksonville, Fla., to serve as senior civil engineer on the construction work at Black and Piney Points for the new naval air station. Nichols will serve as chief engineering aide to COMDR. CARL H. COTTER, engineer in charge of the naval air base work in Duval and Brevard counties. Nichols is a graduate of the University of Oregon, worked with Cotter in 1928 at Hawthorne, Nev., on army work.

SCOTLAND G. HIGHLAND, secretary and general manager of the Clarksburg, Va., water board, has been reappointed to begin his 34th year of service with the Clarksburg water department.

BENJAMIN K. HOUGH, JR., working as engineer in the Binghamton district office, U. S. Engineers, has been appointed lecturer in the civil engineering department at Cornell University. Hough, a graduate of Massachusetts Institute of Technology in 1928, soon after graduation went to Guatemala to work as a surveyor for the United Fruit Co. Returning to this country he was employed on the construction of Wyman Dam in Maine. In 1934 he joined the U. S. Engineers as assistant engineer in the Zanesville, Ohio district office.

TREVOR RHYS CUYKENDALL, instructor in civil engineering at Cornell University, has been made assistant professor of civil engineering. Cuykendall has been in charge of the Cornell photoelasticity work in the school of engineering.

GEORGE B. PULTZ, manager of the Birmingham, Ala., Water Works Co., has retired after 27 years at the Alabama plant. Pultz worked at Racine, Wis., and South Pittsburgh before going to Birmingham. He will be succeeded by H. H. Roeske, who comes from the company's New York offices. L. V. POLLOCK has been appointed chief engineer for the Birmingham plant. Pollock is also being transferred from New York.

JOHN P. HOGAN, who served in 1939 as chief engineer and director of construction for the New York World's Fair, has been made a partner in the New York City engineering firm of Parsons, Klapp, Brinckerhoff & Douglas. Additional new partners are: E. L. MACDONALD, who began his bridge experience with the American Bridge Co. on the erection of the Hell Gate Bridge, S. A. THORESEN, engineer of design of the Detroit and Canada tunnel under the Detroit River, and GENE W. HALL, during the past five years president of Parklap National Builders. Macdonald has been with the New York firm since 1932 to be in charge of the bridge designing work, which has included the Buzzards Bay vertical lift bridge over the Cape Cod Canal and the Pennsylvania Avenue Bridge in Washington, D. C. At present he is engaged on the design of the Army's St. George's Bridge over the Chesapeake and Delaware Canal. Thoresen has been with the firm since 1905, acting as principal designing engineer on tunnels, subways, hydraulic plants and the Cape Cod Canal. Hall joined the firm in 1914, becoming assistant engineer in charge of the Florida office in 1924. He returned to the New York office in 1930.

W. B. HUFFINE, associate engineer with the Public Roads Administration and for the past four years manager of the Wyoming state-wide planning survey, has been transferred to the Denver office of the PRA to serve as assistant to the senior highway engineer.

FRANK MORRIS, traffic engineer for the Iowa State Highway Department, has been appointed a member of a subcommittee by the Iowa traffic safety coordinating committee. Other appointments are: D. W. BURCH, state highway commission, Ames; ED GUNTON, assistant city traffic engineer of Des Moines; H. E. PARRISH, of Boone, superintendent of Northwestern Ry.; C. L. PARSON, engineer of the Burlington R.R.; RAY MCMURRAY, engineer of Jasper County, Iowa, and FRANK E. YOUNG, city engineer of Cedar Rapids.

EDWARD WOLFSON, who graduated from Ohio State University in 1937 with a civil engineering degree, is now employed in the design section of the U. S. District Engineer Office at Huntington, W. Va. From January, 1938, to April, 1939, Wolfson was employed as a draftsman on the design of the Main Avenue Bridge in Cleveland. He was also employed for a time as junior engineer in the bridge department of Cuyahoga County, Ohio.

JACOB MARK, consulting engineer of Brooklyn, N. Y., has enlarged his staff to do appraisal work and advisory work in condemnation proceedings in addition to his work on building design and supervision of new construction.

GEORGE E. WEARN, for many years central station sales manager of the Westinghouse Electric & Mfg. Co. with headquarters at New York, has joined Murray and Flood, Inc., New York City, as vice-president on new development. Wearn after leaving Westinghouse Electric was employed by Republic Steel as sales engineer. He was not in charge of the sales department for Republic Steel as reported in *ENR*, Feb. 8.

MEETINGS

AMERICAN CONCRETE INSTITUTE Chicago, Ill., Feb. 27-29.

AMERICAN SOCIETY FOR TESTING MATERIALS regional meeting, Hotel Statler, Detroit, Mich., March 4-8.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, Chicago, March 12-14.

REGIONAL AND LOCAL

IOWA ENGINEERING SOCIETY, annual convention, Ames, Feb. 29-March 1.

ASSOCIATED GENERAL CONTRACTORS, Minnesota Chapter, Minneapolis, March 7-10.

AMERICAN WATER WORKS ASSOCIATION, Southeastern Section, annual convention, Birmingham, Ala. Mar. 18-20.

NEW JERSEY SEWAGE WORKS ASSOCIATION, silver anniversary convention, Trenton, N. J., Mar. 20-22.

NEW JERSEY MOSQUITO EXTERMINATION ASSOCIATION, annual meeting, Hotel Haddon Hall, Atlantic City, March 20-22.

AMERICAN WATER WORKS ASSOCIATION, Canadian section, annual convention, March 27-29, London, Ont.

NEW YORK STATE Association of Highway Engineers, annual convention, Rochester, N. Y., March 28-30.

ELECTIONS AND ACTIVITIES

COTTON M. HOWARD has been elected president of the Seattle section of the American Society of Civil Engineers. R. G. Tyler has been named vice-president and Fred H. Rhodes, Jr., reelected secretary-treasurer.

NELSE MORTENSEN, head of Nelse Mortensen & Co., Seattle general contractors, is the new president of the Seattle chapter of the Associated General Contractors of America. W. G. Clark has been named vice-president; Henrik Valle, secretary; Noble W. White, treasurer; and C. F. Sanborn, George Teufel, O. B. Daniels and Frank Turnbull, trustees.

WHEN the Nebraska chapter of the Associated General Contractors met Jan. 25 at Omaha, a resolution was passed urging federal aid for flood control and irrigation projects in the Republican-Platte River valley. Morris Freshman, Lincoln, was elected president; Guy Crook, Falls City, N. M. Liggett, Lincoln, and Peter Kiewit, Omaha, vice-presidents; and Milburn D. Johnson, Lincoln, secretary.

THE WYOMING ENGINEERING SOCIETY held its 21st annual convention in the engineering hall at the University of Wyoming, Laramie, last month, 205 engineers attending. Those present included representatives from Denver, the University of Colorado and the Denver office of Public Roads Administration. H. T. Person, University of Wyoming, is the 1940 president. R. J. Templeton, maintenance engineer of the

H. T. PERSON

Wyoming State Highway Department, has been chosen vice-president, and Earl Lloyd, deputy Wyoming state engineer, secretary-treasurer. J. A. Elliot, president and general manager of the Wyoming Development Co., Wheatland, Wyo., is the retiring president. Speakers included L. C. Bishop, Wyoming state engineer; H. D. Comstock, project superintendent, Bureau of Reclamation; A. W. Holliday, University of Wyoming; Frank Kelso, superintendent, Wyoming State Highway Department; J. L. Simmons, manager, planning survey department, Wyoming State Highway Department; C. F. Seifried, office engineer with the Wyoming State Highway Department, and R. D. Goodrich, dean of the college of engineering at the University of Wyoming. Preceding the convention, a meeting of the field and office personnel of the Wyoming State Highway Department was held at Cheyenne.

PROCTOR W. NOYES, engineer now active in planning work at Cleveland, was the principal speaker at the Jan. 23 meeting of the Canton, Ohio, Regional Society of Engineers and Surveyors. W. C. Anderson, president of the group, appointed a committee to list candidates for the annual election April 9 and named a group to make arrangements for the ladies night party Feb. 13.

HAROLD M. QUINN, general manager of the Quinn-Robbins Construction Co. of Boise, has been elected president of the Idaho chapter of the Associated General Contractors of America.

THE BELLINGHAM CONSTRUCTION COUNCIL of Bellingham, Wash., has elected Elwyn Shields as president; Asa Clark, vice-president; Charles A. Standen, treasurer, and Russell E. Lind, secretary.

NEW PRESIDENT of the Memphis-Tennessee Engineers Club is Joseph H. Miller. He appointed J. T. Roberts a member of the technical education committee at a meeting this month when Theodore Reed Kendall of New York City spoke.

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Engineering Conferences

HIGHWAY ENGINEERING, University of Illinois, Urbana, Ill., March 6-8.

TENNESSEE INDUSTRIAL PERSONNEL CONFERENCE, University of Tennessee, Hotel Peabody, Memphis, March 21-22.

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License Examinations

IOWA: Examinations for professional engineering, Mar. 13-14; for land surveying, Mar. 15, State House, Des Moines.

LOUISIANA: Civil engineers and surveyors before state board of engineering examiners; March 6-8 at New Orleans.

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Engineering Schools

ROAD SCHOOL, University of Utah, Salt Lake City, March 4-6.

MUNICIPAL TRAINING school for superintendents of sewers and sewage treatment plant operators, New York University in cooperation with the Municipal Training Institute of New York State, University Heights, March 27-29.

ILLINOIS WATER WORKS, University of Illinois, Urbana, Ill., March 4-8.

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Civil Service Examinations

CALIFORNIA: Consulting hydraulic engineer, $25 to $50 per day. Applications must be filed in Sacramento office of state personnel board by Feb. 28.

OBITUARY

THOMAS F. RYAN, 69, retired construction engineer of Seattle, Wash., died Feb. 13. Ryan, while employed by Stone & Webster Engineering Corp., supervised construction of the Puget Sound Power & Light Co.'s Georgetown plant in Seattle. He was also in charge of the construction of many large buildings in Seattle.

WILLIAM W. CHADSEY, highway superintendent of Schenectady County, N. Y., for the past 16 years, died in Schenectady Feb. 11 at the age of 59. Chadsey upon leaving school began his engineering work with the Schenectady Railway Co., leaving there to work with Brown & Lowe, builders of Schenectady.

RICHARD E. WALTERS, 53, construction engineer with the Middlewest Construction Co., Pittsburgh, died at Greensburg, Pa., this week. Walters, a graduate of the University of Alabama, previous to joining Middlewest Construction was with Mike Manello, contractor of Pennsylvania. Walters at one time served as WPA director for Beaver County, Pa.

FREDERIC L. GARLINGHOUSE, 90, civil engineer and bridge builder of Pittsburgh, died in that city Feb. 11. Garlinghouse received his engineering training at Rensselaer Polytechnic Institute. After a period on railway construction, he joined the Pittsburgh Bridge Co., leaving there to go with Jones & Laughlin Steel Corp. to work 15 years in the structural department before retiring 30 years ago.

JOHN WALTON STEARNS, 74, PWA project engineer of Logansport, Ind., died in that city Feb. 12. Stearns, a civil engineering graduate of Massachusetts Institute of Technology, was a resident of Indianapolis for many years before moving to Logansport about a year and a half ago.

ALFRED J. BENNETT, 59, construction engineer of Seattle, Wash., died Feb. 13. Bennett, formerly a British government engineer in West Africa, had supervised the construction of numerous pulp and paper mills in the Northwest.

Other recent deaths include: W. B. CAUTHORN, 69, for many years city engineer at Columbia, Mo., Columbia; ROBERT M. LIGON, 85, retired building contractor, Waco, Tex.; J. O. METCALF, building inspector of Fort Dodge, Ia., and former general contractor, Fort Dodge; JOHN R. ANDERSON, 58, for 17 years superintendent of the Rutherfordton, N. C., water and light plant, Rutherfordton; DOUGLAS RUTHVEN, 38, sanitary engineer of Gregg County, Tex., Kilgore, Tex.; DAVID R. MCKEE, 60, construction engineer formerly employed in the oil fields of Mexico and Venezuela and a graduate of Yale University with the class of 1903, New York City, and C. D. WELLS, 54, engineer of Elizabethtown, Ky., for the state highway department, Louisville.

CONTRACTS AND CAPITAL

ENGINEERING construction awards for the week total $52,980,000. This volume compares with $38,389,000 reported for the short preceding week, and with $60,863,000 for the short week due to the Washington's Birthday holiday last year.

The current week's awards bring 1940 construction to $403,811,000, 22 per cent lower than in the corresponding 8-week period last year.

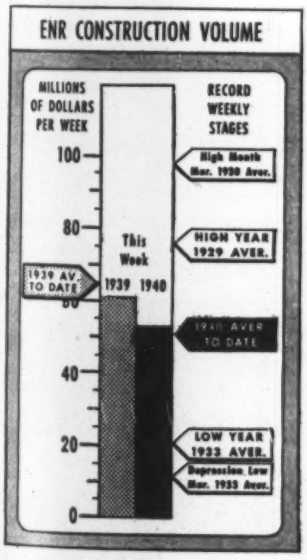
Private awards for the initial 8 weeks of 1940 total $144,630,000, an increase of 21 per cent over the $119,741,000 reported for the 1939 8-week period.

Private construction for the current week reach $17,865,000. This compares with $14,200,000 for a week ago, and $25,561,000 for a year ago. Public construction volume, $35,115,000, compares with $24,189,000 for last week, and $35,302,000 for last year.

In the classified construction groups, all classes of work except earthwork and drainage top their respective volumes for the short preceding week; and bridges, industrial buildings, earthwork and drainage, and streets and roads exceed their totals for the short week last year.

New capital for construction purposes for the week totals $15,431,000. This compares with $291,369,000 for the corresponding 1939 week when $273,500,000 in federal appropriations for WPA construction was added to the new capital figure. The current week's financing is made up of $12,369,000 in state and municipal bonds, and $3,062,000 in corporate security issues.

New construction financing for the year to date, $164,705,000, drops 61 per cent below the volume for the 8-week period last year as a result of the influx of federal money. A comparison of the 1939 and 1940 totals excluding government appropriations reveals a 7.5 per cent gain for the current year.



CONTRACTS

(Thousands of dollars)

	Week Ending Feb. 23 1939	Feb. 15 1940	Feb. 22 1940
Federal	$4,345	$6,405	$6,019
State & Municipal	30,957	17,784	29,096
Total public	$35,302	$24,189	$35,115
Total private	25,561	14,200	17,865
TOTALS	$60,863	$38,389	$52,980
Cumulative 1940	(8 weeks)		$403,811
1939	(8 weeks)		$515,536

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial building, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1939 8 Wks.	1940 8 Wks.
NON-FEDERAL	$152,924	$164,705
Corp. securities	29,737	28,214
State & Mun.	107,511	75,144
R.E.A. loans	15,631	.....
U.S.H.A. loans	.....	60,786
R.F.C. loans	45	561
FEDERAL	$273,500	$.....
TOTAL CAPITAL	$426,424	$164,705

FHA MORTGAGES

	Week Ending Feb. 18 1939	Feb. 10 1940	Feb. 17 1940
Selected for appraisal	$20,467	$19,439	$19,487*
Cumulative 1940	(7 weeks)		$116,026*
1939	(7 weeks)		$130,253

* Subject to revision.

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Feb., '40	238.32	114.56
Building Cost	Feb., '40	201.50	108.93
Volume	Jan., '40	173	76

Long Highway Completed In Mexico

The highway connecting Mexico City and Guadalajara, an important link in Mexico's trunk highway system, has been completed at a cost of about $5,000,000. The road is a section of Mexico's western contribution to the Pan American Highway and is more than 400 miles in length. Four years were required for its construction.

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

PASSAIC RIVER BRIDGE NEW JERSEY

OWNER: New Jersey State Highway Dept., E. D. Sterner, commissioner, Trenton, N. J.; Morris Goodkind, bridge engineer. Ash, Howard, Needles & Tammen, consulting engineers.

PROJECT: Constructing superstructure of bridge across Passaic River between Newark and Kearny, on Route 25, New Jersey. Consists of lift span 332½ ft. long; two towers each 24 ft. long; two approach girder spans each 112 ft. long; and seventeen approach girder spans each about 80 ft. long. Over-all length of bridge about 2,000 ft.

CONDITIONS: Contractor to furnish all materials and complete work in about 15 months. Rail, highway and water transportation available. Wages prevailing in area range from $1.25 to $2.00 per hr. for skilled labor; $1.12½ to $1.25 for semi-skilled; and $1.12½ per hr. for common labor.

BIDS: Four bids were opened October 17, 1939, ranging from the contract low of $1,099,506 to $1,275,640 for the third low. High bid amount not available.

LOW BIDDERS:

1. American Bridge Co., New York, N. Y. (contract) $1,099,506
2. Harris Structural Steel Co., New York, N. Y. 1,229,433
3. Bethlehem Steel Co., Bethlehem, Pa. 1,275,640

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Structural steel, lift span, towers, flanking span	6,630,000 lb.	$0.0786	$0.0875	$0.0912
2. Galv. span roadway floor	L.S.	32,569.00	36,600.00	33,750.00
3. Lift span sidewalk floor	L.S.	11,836.00	13,275.00	10,700.00
4. Concrete, counterweight	560 c. y.	20.15	22.00	34.50
5. Cl. B. conc., structures	75 c. y.	42.00	36.50	26.00
6. Reinforcing steel, struct.	10,000 lb.	.095	.09	.054
7. Counterweight ropes	92,000 lb.	.1492	.1875	.257
8. Balance chains	123,000 lb.	.0618	.081	.0875
9. Counterweight sheaves	300,000 lb.	.1145	.162	.144
10. Machinery	190,000 lb.	.3418	.33	.30
11. Cranes and hoists	L.S.	3,533.00	3,100.00	3,600.00
12. Electrical equipment	L.S.	139,330.00	143,750.00	163,446.12
13. Elevators	L.S.	12,147.00	13,200.00	11,900.00
14. Houses and equipment	L.S.	14,406.00	14,500.00	8,600.00
15. Pier rooms and equipment	L.S.	6,185.00	9,900.00	6,900.00
16. Structural steel, approach spans	3,271,400 lb.	.0573	.064	.0692
17. Railing	2,746 l. f.	5.50	9.90	7.70
18. 6-in. c. i. water pipe	193 l. f.	8.56	8.10	4.90
19. 8-in c. i. water pipe	382 l. f.	8.36	9.50	5.80
20. 3-in. gen. wrt. iron conduit	1,100 l. f.	1.47	2.80	1.25
21. Manhole with cover and frame	1 ea.	361.00	185.00	360.00
22. Clearing site	L.S.	13,000.00	15,500.00	23,250.00

OUTLET WORKS OKLAHOMA

OWNER: U. S. Engineer Office, Tulsa, Okla.; Capt. H. A. Montgomery, district engineer.

PROJECT: Construction of uncontrolled weir type concrete spillway and outlet works for Fort Supply reservoir, located on Wolf Creek, Fort Supply, Okla.

CONDITIONS: Contractor to furnish all materials and complete project in 400 working days. Rail and highway transportation facilities available. Job located in "dust bowl" where sandy soil blows badly. Temperature extremes may be encountered. Government owned camp is furnished for use of contractors' employees. Source of aggregates at distance from job. Wages are: skilled, $1.25 per hr.; semi-skilled, 75c.; and common labor, 40c. per hr.

BIDS: Nine bids were opened November 10, 1939, ranging from the contract low of $586,416 to $762,653. Government estimate, $671,887.

LOW BIDDERS:

1. Uvalde Constr. Co., and Keliher Constr. Co., Dallas, Tex. (contract) $586,416
2. Morrison-Knudsen Co., Inc., Los Angeles, Calif. 586,971
3. Western Contracting Co., Sioux City, Iowa 626,509

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Cofferdam	L. S.	$18,530.00	$8,500.00	$10,000.00
2. Unclassified excav	180,000 c. y.	.35	.347	.373
3. Special excavation	2,600 c. y.	1.00	3.50	2.03
4. Trench excavation	1,300 c. y.	3.50	4.80	9.65
5. Excav., borrow area III	50,000 c. y.	.30	.10	.228
6. Foundation protection	700 sq.	1.50	1.00	1.90
7. Backfill	55,000 c. y.	.55	.30	.60
8. Cement	35,000 bbl.	2.50	2.50	3.03
9. Concrete, Class A	10,200 c. y.	10.00	10.25	9.70
10. Concrete, Class B	18,600 c. y.	9.66	11.25	10.80
11. Reinforcing steel	1,700,000 lb.	.044	.04	.045
12. Miscellaneous metal	13,300 lb.	.15	.15	.12
13. Misc. black steel pipe	2,500 lb.	.15	.12	.10
14. Misc. wrought iron pipe	2,400 lb.	.30	.13	.14
15. Misc. cast iron pipe	15,500 lb.	.10	.11	.08
16. Copper water stops	530 lb.	.50	.70	.90
17. Steel water stops, corr.-resist.	3,400 lb.	.45	1.00	.40
18. 42-in. drainage pipe and gate	L. S.	1,000.00	1,600.00	269.00
19. Gravel in drains	11 c. y.	5.00	8.00	5.00

DUMPING BOARD NEW YORK

OWNER: Borough President of Manhattan, Municipal Building, New York, N. Y. Lester C. Hammond, engineer.

PROJECT: Sanitation dumping board complete with ramps, East River Drive, between E. 91 and E. 92 St. Involves dredging of overlying materials and rock in East River to a depth of 20 feet below mean high water, and erection of piers and piling.

CONDITIONS: Rail, highway and water transportation facilities available. Contractor to furnish all materials and complete work by May 22, 1940. Prevailing hourly wages are: $1.15 to $2.25 for skilled labor; 87½c. to $1.50 for semi-skilled; and 62½c. to $1.50 for common labor.

BIDS: Eleven bids were received November 17, 1939, ranging from the contract low of $557,830 to $654,500.

LOW BIDDERS:

1. P. T. Cox Contracting Co., New York, N. Y. (contract) $557,830
2. Rosoff Bros., Inc., New York, N. Y. 558,643
3. Lynn Construction Co., Inc., New York, N. Y. 567,000

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Permanent ramp and dumping board, superstr. complete	L.S.	$294,000.00	$277,098.00	$321,595.00
2. Dredging overlying material	3,500 c. y.	2.00	2.00	3.00
3. Remove rock	6,000 c. y.	18.00	25.00	15.00
4. Conc. fndn. piers, type P-1	265 l. f.	80.00	63.00	64.00
5. Conc. fndn. piers, type P-2	290 l. f.	60.00	63.00	47.00
6. Steel piles 10-in. by ⅝-in.	650 l. f.	5.00	3.00	6.53
7. Steel piles 12-in. by ½-in.	580 l. f.	6.00	4.50	6.53
8. Steel piles 16-in. by ½-in.	400 l. f.	7.00	6.00	10.00
9. Creosoted timber piles	20,400 l. f.	1.50	1.10	1.70
10. Rip rap	7,400 c. y.	2.50	1.80	1.60
11. Oak fender piles	15,600 l. f.	.90	.80	1.25
12. Creosoted lumber	150 Mbm	200.00	190.00	200.00
13. Untreated lumber	42 Mbm	180.00	140.00	150.00